Academic Program Description Form

University Name: Al- Nahrain University
Faculty/Institute: College of Science
Scientific Department: Computer Science
Academic or Professional Program Name: Master in Computer Science
Final Certificate Name: Master in Computer Science
Academic System: Semester System
Description Preparation Date: 12/1/2025
File Completion Date: 12/1/2025

Signature:
Scientific Associate Name: Manaf Adnan
Date:

Signature: K.H.A.
Head of Department Name:
Assi. Prof. Dr. Khamael Al-Dulaimi
Date:

The file is checked by:
Department of Quality Assurance and University Performance
Director of the Quality Assurance and University Performance Department:
Date:
Signature:

Dean of Science College Approval

Course Description Form

1. Course Name:
Big Data
2. Course Code:
3. Semester / Year:
First Semester 2024/2025
4. Description Preparation Date:
1-9-2024
5. Available Attendance Forms:
Traditional Attendance (in-person) Blended Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
30/2
7. Course administrator's name (mention all, if more than one name)
Dr. Suhad A. Yousif Email:suhad.a.yousif@nahrainuniv.edu.iq
8. Course Objectives

Course Objectives	• Fundamental Understanding of Big Data Concepts: Ensure students grasp key concepts such as data volume, velocity, variety, and veracity. Discuss the evolution and significance of big data in modern computing. • Proficiency in Big Data Technologies: Teach students about various big data technologies and platforms like Hadoop, Spark, NoSQL databases, and cloud-based big data solutions. • Data Analytics and Processing Skills: Develop students' ability to perform data analytics, including the use of statistical methods, machine learning algorithms, and data mining techniques suitable for large datasets. Data Management and Storage: Educate on effective methods for storing, retrieving, and managing big data, including distributed file systems, data warehousing, and data lakes. • Practical Application and Problem Solving: Provide hands-on experience through projects or case studies that involve real-world big data challenges, encouraging students to apply their knowledge to solve practical problems.

9. Teaching and Learning Strategies

Strategy	• Flipped Classroom: Assign foundational material (readings, tutorials, or recorded lectures) for students to review before class. • Use in-class time for practical activities like coding, problem-solving, or case study discussions. • b. Hands-On Lab: Provide datasets and tasks requiring students to use tools like Apache Spark, Hadoop, SQL, Python (Pandas, NumPy). • c. Project-Based Learning • Assign semester-long group projects where students design, implement, and present a Big Data solution. • Include datasets and scenarios from domains like healthcare, finance, or social media to diversify learning. • e. Peer Learning: Encourage group activities, discussions, and code reviews to enhance collaborative skills and knowledge sharing.

10. Course Structure

Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2	What is Big data?	✓ Characteristics of Big Data (Volume, Velocity, Variety, Veracity, Value) ✓ Importance and Applications of Big Data	**Lectures Presentation**	**Lab for coding**

2	2	Big Data Technologies and Ecosystem	✓ Hadoop, Spark, NoSQL databases, and other key technologies ✓ Overview of Big Data processing frameworks ✓ Understanding data storage options	=	=
3	2	Distributed File Systems and Data Storage	✓ HDFS (Hadoop Distributed File System) ✓ Data replication and fault tolerance ✓ Storage strategies for big data	=	=
4	2	MapReduce and Hadoop	✓ Introduction to MapReduce ✓ Hadoop ecosystem components ✓ Writing MapReduce programs	=	=
5	2	Apache Spark	✓ Introduction to Spark ✓ RDDs (Resilient Distributed Datasets) ✓ Spark transformations and actions	=	=

6	2	Introduction to Data Analytics	✓ Types of analytics (Descriptive, Diagnostic, Predictive, Prescriptive) ✓ Data mining and machine learning ✓ Data visualization for insights	=	=
7	2	Advanced Analytics with Spark	✓ Machine learning libraries in Spark	=	=
8	2	Advanced Analytics with Spark	✓ Building and evaluating predictive models' performance.	=	=
9	2	NoSQL Database Concepts	✓ Introduction to NoSQL databases ✓ Types of NoSQL databases (Document, Key-Value, Column-Family, Graph)	=	=
10	2	Hands-on with NoSQL Databases	✓ A comparison between common NoSQL databases.	=	=

11	2	Cloud Computing and Big Data	✓ Introduction to cloud platforms (AWS, Azure, GCP) ✓ Deploying big data solutions in the cloud ✓ Cost considerations and scalability	=	=
12	2	Mid Exam		=	=
13	2	Project Kickoff	✓ Explanation of the course project ✓ Choosing a dataset and problem statement ✓ Forming project teams	=	=
14	2	Project Work Sessions	✓ Guided project work sessions ✓ Project presentations and feedback	=	=

11. Course Evaluation

20% for the formal final writing exam
10 % for the practical exam
70 % for the formal final writing exam

12. Learning and Teaching Resources

Required textbooks (curricular books any)	• **"Big Data: Principles and Best Practices of Scalable Real-Time Data Systems"** • Author: Nathan Marz and James Warren

	• Focus: Core concepts and architecture of Big Data systems, real-time data processing. • **"Big Data Processing with Apache Spark"** • Author: Srini Penchikala • Focus: Hands-on guidance on using Apache Spark for processing large datasets.
Main references (sources)	• **"Mining of Massive Datasets"** • Authors: Jure Leskovec, Anand Rajaraman, and Jeffrey D. Ullman • Focus: Algorithms and techniques for analyzing large-scale data.
Recommended books and references (scientific journals, reports…)	**Big Data and Business Analytics"** • Editors: Jay Liebowitz • Focus: Applications of Big Data in business contexts. **Journal of Big Data** • Topics: Advances in Big Data analytics, machine learning, and applications. • Publisher: Springer. **IEEE Transactions on Big Data** • Topics: Research papers on Big Data systems, tools, and applications.
Electronic References, Websites	• **Coursera** Courses on Big Data by top universities (e.g., University of California San Diego's "Big Data Specialization"). • **edX** Big Data programs, such as MIT's "Data Science and Big Data Analytics.

	• **Apache Spark Documentation** URL: https://spark.apache.org/documentation.html • **Hadoop Documentation** URL: https://hadoop.apache.org/docs/ •

Course Description Form

1. Course Name: Internet of Things
2. Course Code:
3. Semester / Year: 2023-2024
4. Description Preparation Date: 18/02/2024
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total) 2 Hours in each 15 weeks
7. Course administrator's name (mention all, if more than one name)
Prof. Dr. Abdulkareem Merhej Radhi
8. Course Objectives

Course Objectives	This course aims to Design and implement an Internet of Things system from scratch. During this course, students will acquire multiple skills in building different types of Internet of Things systems according to the proposed applications. They will also have the ability and skill in how to invest in artificial intelligence systems in building systems capable of analyzing data and making smart decisions. In addition to learning about the different protocols that are used to send and receive data to and from the various units that make up those systems.

9. Teaching and Learning Strategies

Strategy	**Lectures: 15 Weeks, Two Theoretical Hours for Each week with two hours practical for ea Week. This material includes: Introduction to how to use microcontrollers, microprocesso and specialized programming languages in designing and implementing various applicatio Also understanding the artificial intelligence algorithms that can be used to analyze data make smart decisions and understanding the methods and means used to employ the Wo Wide Web to send and receive data from its various sources.**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Evolution of IOT	Introduction to IOT	Power Point slides with Tut.	
2	2	Recognize IOT Systems	Characteristics of IOT	Power Point slides with Tut.	Quiz
3	2	IOT Architecture	Logical and Physical Design		
4	2	**IOT Protocols def.**	Communications Protocols in IOT	Power Point slides with Tut.	Test
5	2	Sensor Types for IOT	Sensors in IOT Networks	Power Point slides with Tut.	
6	2	M2M & IOT	Difference between IOT and M2M	Power Point slides with Tut.	Mid Exam.1
7	2	Design Methodology	IOT Design	Power Point slides with Tut.	
8	2	Microcontroller Specifications	Introduction to Microcontroller	Power Point slides with Tut.	Quiz
9	2	C++ Language	Introduction to Microcontroller Languages	Power Point slides with Tut.	
10	2	Microprocessor Specifications	Introduction to Microprocessor	Power Point slides with Tut.	
11	2	Python Language	Introduction to |Microprocessor Languages	Power Point slides with Tut.	
12	2	AI for Processing data	Data Processing and Analysis	Power Point slides with Tut.	Mid Exam 2.
13	2	Cloud in IOT	Cloud Computing	Power Point slides with Tut.	
14	2	Fog In IOT	Fog Computing	Power Point slides with Tut.	
15	2	projects	Case Studies	Power Point slides with Tut.	

11. Course Evaluation

Case Studies and Projects will be a precise evaluation scenario to evaluate the skills and learning outcome for students.

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	.Internet of Things: A Hands-On Approach: Arsheep Bahga & Vijay Madisetti, 2015.
Main references (sources)	Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5, Springer. Rajkumar Buyya, Internet of Things Principles and Paradig ELSEIVER , 2015..
Recommended books and references (scientific journals, reports…)	Peter Waher, "Learning Internet of Things", PACKT publishi 2016.
Electronic References, Websites	Https:// www. Google. Design of IOT

Course Description Form

1. Course Name:
Computer Networks and Web Technology
2. Course Code:
3. Semester / Year:
1st / Master
4. Description Preparation Date:
12-11-2024
5. Available Attendance Forms:
Compulsory
6. Number of Credit Hours (Total) / Number of Units (Total)
45 Hours (Theory) / 3 Units
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Jamal M. Kadhim Email: jamal.mohammedkadhim@nahrainuniv.edu.iq
8. Course Objectives

Course Objectives	• Understanding Computer networks. • Understanding 7-model layers. • Understanding protocols of each layer and packet journey from source to destination. • Understanding host addressing through IPv4.0 and IPv6.0.

9. Teaching and Learning Strategies	
Strategy	Lectures, problem classes

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3		Introduction to computer Networking.	Formal Lectures	Class Activity
2	=		Application Layer.	=	Class Activity

3	=		Application Layer.	=	Class Activity
4	=		Transport Layer.	=	Class Activity
5	=		Transport Layer.	=	Class Activity
6	=		Client-server and wireshark program	=	Class Activity
7	=		First Mid-Exam	=	
8	=		Network Layer	=	Class Activity
9	=		Network Layer	=	Class Activity
10	=		Data Link Layer	=	Class Activity
11	=		Data Link Layer	=	Class Activity
12	=		Second mid-exam	=	Class Activity
13	=		Physical layer	=	Class Activity
14	=		Networking Tools	=	Class Activity

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Computer networking : a top-down approach / James F. Kurose, Keith W. Ross.—7th ed.
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Computer Vision
2. Course Code:
3. Semester / Year:
Second Semester / Master year
4. Description Preparation Date:
5/11/2024
5. Available Attendance Forms:
Attendance Mandatory
6. Number of Credit Hours (Total) / Number of Units (Total)
30 Hours (theoretical) / 2 Units
7. Course administrator's name (mention all, if more than one name)
Name: Assist. Prof. Dr. Zainab Namh Abdula Email: zainab.namhabdula@nahrainuniv.edu.iq
8. Course Objectives

Course Objectives	The objective of this course is to equip students with the fundamental principles needed to analyze, interpret, and manipulate visual data using several algorithms and techniques. The students will understand both the theoretical foundations and real-world applications of computer vision, including the ability to comprehend and implement algorithms that can recognize, classify, and interpret images.

9. Teaching and Learning Strategies

Strategy	Lectures Project-Based Learning Seminars Frequent Quizzes

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
W1	2	Introduce the students to the concept of Computer Vision and gain an understanding of how the human visual system	Introduction to Computer Vision and applications Human Visual System overview and Color Spaces	Lecture Slides	Oral Questions
W2	2	students will gain a comprehensive understanding of how images are created and represented digitally then applying the concept of linear algebra and its applications in image manipulation	Image Formation Model Image sampling and quantization Affine Transformation	Lecture Slides	Oral Questions Homework
W3	2	Students will understand how pixels represent images digitally and how filters can modify image properties	Pixels and Filters Image Histograms Spatial Filters Correlation and Convolution	Lecture Slides	Oral Questions
W4	2	students will learn how to analyze and manipulate images based on their frequency components rather than just spatial details	Filtering in Frequency domain Discrete Fourier Transform	Lecture Slides	Oral Questions Quiz
W5	2	students will understand how to partition an image into meaningful regions, which is essential for object detection and recognition	Image Segmentation Otsu Method K -Means	Lecture Slides	Oral Questions
W6	2		Mid Exam 1		
W7	2	students will learn how to identify and highlight boundaries within images, which is fundamental for understanding shapes and objects	Edge Detection Sobel Filter Canny Edge Detection Image Filtering effect	Lecture Slides	Oral Questions and Homework
W8	2	students will gain skills in detecting essential geometric features in images	Hough Transform Harris Corner Detection	Lecture Slides	Oral Questions
W9+10	4	students will learn how	Image Features Local vs	Lecture	Quiz

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
		to characterize images based on texture and structure at different scales.	Global Local Binary Pattern GLCM Histogram Oriented Gradients	Slides and Worked Examples	
W11	2		Mid exam 2		
W12	2	students will develop skills essential for building and evaluating effective image classification models.	Image Classification Recall and Precision Problems Image Augmentation and Feature Engineering	Lecture Slides and Worked Examples	Oral Questions
W13	2	students will learn how to identify and locate multiple objects within an image or video frame,	Object Detection	Lecture Slides and Worked Examples	Oral Questions
W14	2	students will learn techniques to automatically identify and locate human faces in images or video streams	Face Detection	Lecture Slides and Worked Examples	Oral Questions
W15	2		Projects		

11.Course Evaluation

Assessment Type	Marks
Homework	5
Attendance	5
Mid Exam	20
Final Exam	70
Total	100

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	Computer Vision: Foundations and Applications © 2017 Compiled by Ranjay Krishna published by Stanford University Computer Vision: Algorithms and Applications by Richard Szeliski.
Main references (sources)	Digital Image Processing, 4th edition by Rafael C. Gonzalez • Richard E. Woods

Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	https://www.ssla.co.uk/digital-image-processing https://www.sanfoundry.com/1000-digital-image-processing-questio answers/

Course Description Form

1. Course Name:

Data Analysis and Visualization

2. Course Code:

3. Semester / Year:

Second Semester 2024-2025

4. Description Preparation Date:

2-1-2025

5. Available Attendance Forms:

Traditional Attendance (in-person), Blended Attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

30/2

7. Course administrator's name (mention all, if more than one name)

Suhad A. Yousif Email: suhad.a.yousif@nahrainuniv.edu.iq

8. Course Objectives

Course Objectives	• Develop a strong foundation in data analysis concepts and techniques, including descriptive and inferential statistics, data cleaning, and data preparation. • Master key data visualization principles and techniques to effectively communicate insights using modern tools. • Equip students with the ability to work with popular data analysis and visualization tools, including Python (Pandas, Matplotlib, Seaborn), R, and Tableau. • Foster problem-solving skills by analyzing real-world datasets across various domains such as healthcare, business, and social media. • Encourage collaborative and project-based learning to develop teamwork and professional communication skills.

9. Teaching and Learning Strategies

Strategy	• **Flipped Classroom**: Assign pre-class readings, tutorials, or recorded lectures on data analysis techniques and tools for students to review. Use class time for coding exercises, group discussions, and case studies. • **Hands-On Lab**: Provide datasets and practical tasks requiring the use of Python, R, and visualization software. • **Project-Based Learning**: Assign semester-long projects where students identify, analyze, and visualize datasets to solve a problem and present their findings. • **Peer Learning**: Facilitate group activities, code reviews, and collaborative analysis sessions.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

	2	Introduction to Data Analysis and Visualization	Overview of Data Analysis Tools	Lectures	Presentation and Lab Exercises
2	2	Data Cleaning and Preparation	Handling Missing Data, Outliers	Hands-On Lab	Lab Assignments
3	2	Descriptive Statistics and Visualization	Summary Statistics, Histograms	Lectures and Labs	Lab Exercises
4	2	Inferential Statistics	Hypothesis Testing, Confidence Intervals	Lectures and Labs	Quizzes
5	2	Exploratory Data Analysis	Correlation Analysis, Scatter Plots	Hands-On Lab	Lab Assignments
6	2	Advanced Visualization Techniques	Heatmaps, Geospatial Plots	Lectures and Labs	Lab Assignments
7	2	Introduction to Machine Learning for Visualization	Clustering, Regression Models	Lectures	Lab Exercises
8	2	Tools for Interactive Visualization	Tableau, Dash	Lectures and Labs	Practical Exam
9	2	Storytelling with Data	Narrative Techniques, Dashboards	Lectures and Labs	Project Proposal
10	2	Ethical Considerations in Data Analysis	Bias, Fairness, Privacy	Lectures	Class Discussions
11	2	Mid Exam		Exam	Written Exam
12	2	Project Kickoff	Choosing Datasets, Teams	Guided Labs	Feedback Sessions
13-14	4	Project Work Sessions	Developing and Finalizing Projects	Hands-On Lab	Instructor Review
15	2	Final Project Presentations		Presentations	Grading and Feedback
	2	Introduction to Data Analysis and Visualization	Overview of Data Analysis Tools	Lectures	Presentation and Lab Exercises

11. Course Evaluation

- 20% for the formal final written exam
- 10% for practical tasks and exercises
- 70% for the final project evaluation

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	• "Practical Statistics for Data Scientists" by Peter Bruce and Andrew Bruce Focus: Core statistical methods and their application in data analysis. • "Storytelling with Data" by Cole Nussbaumer Knaflic Focus: Best practices for effective data visualization and communication.
Main references (sources)	• "Python for Data Analysis" by Wes McKinney Focus: Practical guidance on data manipulation and analysis with Python. • "Interactive Data Visualization for the Web" by Scott Murray Focus: Creating interactive visualizations using web technologies.

Recommended books and references (scientific journals, reports…)	• Journal of Data Science • IEEE Transactions on Visualization and Computer Graphics
Electronic References, Websites	• Kaggle (https://www.kaggle.com) Platform for datasets and data analysis competitions. • Tableau Public (https://public.tableau.com) Resource for creating and sharing interactive visualizations. • Python Documentation (https://docs.python.org) Comprehensive documentation on Python libraries for data analysis.

Course Description Form

1. Course Name:

Deep Learning

2. Course Code:

3. Semester / Year:

Second / 2024-2025

4. Description Preparation Date:

17/10/2024

5. Available Attendance Forms:

In the class

6. Number of Credit Hours (Total) / Number of Units (Total)

45 hours / 3 units

7. Course administrator's name (mention all, if more than one name)

Name: Prof. Dr. Ban N. Dhannoon
Email: ban.n.dhannoon@nahrainuniv.edu.iq

8. Course Objectives

Course Objectives	• **This course discusses the latest deep learning models that researchers are currently using. Different deep architectures and their components are discussed in detail.** • **It also discusses algorithms used to train deep architectures to improve deep models. These deep architectures are not only capable of learning complex tasks but can even outperform humans in some custom applications.**

9. Teaching and Learning Strategies

Strategy	**Provide lectures in PowerPoint slide show** **Execute selected methods for more understanding**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	• Shallow Learning • Why to Use Deep Learning • How Deep Learning Works		Powerpoint	
2	3	• Convolutional Neural Network (ConvNet/CNN) Convolution Operation			

3	3	• Architecture of CNN.			
4	3	• Training Convolution Neural Networks Loss Functions and Softmax Classifier			
5	3	• Gradient Descent-Based Optimization Techniques Challenges in Training Deep Networks			
6	3	Mid 1			
7	3	• Weight Initialization Techniques			
8	3	• LeNet-5 • AlexNet			
9	3	• ZFNet • VGGNet			
10	3	• GoogleNet • ResNet			
11	3	• (DenseNet) • Capsule Network			
12		• Restricted Boltzmann Machine (RBM)			
13		Mid 2			
14	3	• Deep Belief Network Deep Autoencoders			
15	3	Generative Adversarial Networks			

11. Course Evaluation

Final Exam 70
Mid1 Exam 10
Mid2 Exam 10
Two monthly projects 10

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	• Advances in Deep Learning, 2020
Main references (sources)	• Dive in Deep Learning 2019
Recommended books and references (scientific journals, reports…)	• The Little Book of Deep Learning, François Fleuret, 2023
Electronic References, Websites	• Youtube

Course Description Form

1. Course Name:
Information and Network Security
2. Course Code:
3. Semester / Year:
2nd / Master
4. Description Preparation Date:
12-11-2024
5. Available Attendance Forms:
Compulsory
6. Number of Credit Hours (Total) / Number of Units (Total)
45 Hours (Theory) / 3 Units
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Jamal M. Kadhim Email: jamal.mohammedkadhim@nahrainuniv.edu.iq
8. Course Objectives

Course Objectives	*Understanding Computer Security.* *- Understanding Cryptography* *- Understanding Access Control.* *- Understanding Network Security Protocols*

9. Teaching and Learning Strategies	
Strategy	Lectures, problem classes

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3		Introduction to ormation Security	Formal Lectures	Class Activity
2	=		Cryptography- Cry basics	=	Class Activity
3	=		Cryptography – Symme Key Crypto	=	Class Activity

4	=		Cryptography – Symme Key Crypto	=	Class Activity
5	=		Cryptography – Public Crypto	=	Class Activity
6	=		Cryptography – Public Crypto	=	Class Activity
7	=		Mid term Exam	=	
8	=		Access control Authentication	=	Class Activity
9	=		Access control Authentication	=	Class Activity
10	=		Access control Authorization	=	Class Activity
11	=		Access control Authorization	=	Class Activity
12	=		Second mid-exam	=	Class Activity
13	=		Simple Authenticat Protocols	=	Class Activity
14	=		Real World Secu Protocols	=	Class Activity

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	▪ Information Security: principles and practice, Mark Stamp 2012
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Natural language Processing
2. Course Code:
3. Semester / Year:
Master
4. Description Preparation Date:
13 Oct 2024
5. Available Attendance Forms:
Attendance Study
6. Number of Credit Hours (Total) / Number of Units (Total)
30 Hours Per Course
7. Course administrator's name (mention all, if more than one name)
Assistant prof. Abeer Khalid Al-Mashhadany
8. Course Objectives

Course Objectives	• Natural Language Processing (NLP) is a branch of Artificial Intelligence t studies how machines understand human language. Its goal is to b systems that can make sense of text and perform tasks like translati summarization, grammar checking, or topic classification. This course includ N-gram Language Models, Naive Bayes and Sentiment Classification, Ve Semantics and Embeddings, Part Of Speech Tagging and Sequence Labeli Constituency Grammars, Logical Representations of Sentence Meani Machine Translator, Information extraction, Summarization, Quest Answering, and Dialogue Systems and Chatbots.

9. Teaching and Learning Strategies	
Strategy	• Books, theoretical lectures and references to helpful websites

	• Providing the electronic presentation of the lecture…as an aid to clarification during t explanation of the lecture • Explanation on the board and solving examples with integrated details • Design and implementation of practical programs for programming algorithms • Solve multiple examples and engage the student by providing quick exercises, the opportunity to solve on the board, and motivating students to follow up and correct each oth • Homework examples from the article • In addition to homework that focuses on strengthening the student's programming

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	Introduction to NLP	• NLP tasks; • NLP Applications • The problem of ambiguity	• NLP tasks; syntax, semantics, and pragmatics. • NLP Applications; information extraction, question answering, and machine translation. The problem of ambiguity		
2	N-gram Language Models	• Language models. • N-gram models. •	• The role of language models. • Simple N-gram models.		
3	Naive Bayes and Sentiment Classification	• Naive Bayes • Sentiment Analysis	• Naive Bayes Classifiers • Optimizing for Sentiment Analysis		
4	Vector Semantics and Embeddings	• Lexical Semantics • Vector Semantics • Words and Vectors	• Lexical Semantics • Vector Semantics Words and Vectors		
5	Part-of-Speech Tagging	• English Word Classes • The Penn Treebank Part-of-Speech Tagset • Part-of-Speech Tagging	• HMM Part-of-Speech Tagging • Maximum Entropy Markov Models Part-of-Speech Tagging for Morphological Rich Languages		
6	Mid#1	•			
7	Constituency Grammars	• Context-Free Grammars • Grammar Rules for English	• Treebanks • Grammar Equivalence and Normal Form • Lexicalized Grammars		
8	Logical Representations of Sentence Meaning	• Computational Desiderata for Representations • Model-Theoretic Semantics	• First-Order Logic • Event and State Representations • Description Logics		
9	Information Extraction	• Named Entity Recognition Relation Extraction	• Extracting Times • Extracting Events and their Times Template Filling		
10	Summarization	• Extraction-based			

		summarization • Abstractive-based summarization • Single vs. Multi-document summarization • Indicative vs. informative Document length and type			
11	Mid#2				
12	Question Answering	• IR-based Factoid Question Answering • Knowledge-based Question Answering • Using multiple information sources: IBM's Watson Evaluation of Factoid Answers			

11. Course Evaluation

Weekly exercise	10 marks
One report per course, written papers	05 marks
Monthly, Two mids, written exams,	10marks
HW, written 5 examples per course	05 marks
Final Exam	70 marks

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	"Speech and Language Processing", by Daniel Juraf James H. Martin, Stanford University, Copyright c 2019
Main references (sources)	Natural Language Processing with Python, by Ste Bird, Ewan Klein and Edward Loper, Copyright © 2019
Recommended books and references (scientific journals, reports…)	"Speech and Language Processing", by Daniel Juraf James H. Martin, Stanford University, Copyright c 2019
Electronic References, Websites	Natural Language Processing with Python, by Ste Bird, Ewan Klein and Edward Loper, Copyright © 2019

Course Description Form

1. Course Name: Recommender Systems

2. Course Code:

3. Semester / Year: Second Semester/ Postgraduate Studies

4. Description Preparation Date:2024-2025

5. Available Attendance Forms: Full time

6. Number of Credit Hours (Total) / Number of Units (Total):30 hour\ 2 units

7. Course administrator's name (mention all, if more than one name)

Name: Ass. Prof.Dr.Nadia Fadhil AL-Bakri
Email: nadia.f.al-bakri@nahrainuniv.edu.iq

8. Course Objectives

Course Objectives	The fundamental and practical aspects of Recommender systems are are defined, focusing on theory as well as on the practical use and applications of Recommender systems. Recommender systems are around us and are encountered on multiple domains such as e-commerce, content and media distribution, social media and so on. The course aims to explain both basics and advanced topics and concepts for recommender systems.

9. Teaching and Learning Strategies

Strategy	**Conceptual Introduction**: Start by introducing the fundamental concepts of recommen systems, such as collaborative filtering, content-based filtering, and hybrid methods. **Real-World Examples**: Use case studies and real-world examples to illustrate how recommender systems are used in various applications such as e-commerce, streaming services, social media, and online learning platforms. **Interactive Discussions**: Facilitate interactive discussions and debates on topics such as algorithmic bias, privacy concerns, ethical considerations, and the social implications of recommender systems. **Assessment**: Assess student learning through a variety of methods such as quizzes, exams, presentations, project reports, code reviews, and peer evaluations

10. Course Structure

Week	Hours	Required	Unit or subject name	Learning method	Evaluation method

1	2 theory		Introduction and basic taxonomy of recommender systems Recommender System Formal Definitions. Personalized verse Non-personalized RSs. Data and Knowledge Sources.	Formal Lectures	Class Activity
2	=		Recommender System challenges. Similarity measures and prediction formulas in RS.	Formal Lectures	Class Activity and Quiz
3	=		Collaborative Filtering (CF)-based Recommender System. Memory-BasedMethods (Neighborhood-Based). User-based Collaborative Filtering.	Formal Lectures	Class Activity
4	=		Item- Based Collaborative Filtering. Model-Based Collaborative Filtering Methods. Collaborative Filtering challenges.	Formal Lectures	Class Activity
5	=		Content-Based Recommender System. Content representation. Similarity-based retrieval. Content-Based challenges.	Formal Lectures	Class Activity
6	Mid1 exam				
7	=		Knowledge-based Recommendation. Knowledge representation and reasoning. Interacting with constraint-based recommenders.	Formal Lectures	Class Activity
8	=		Demographic Recommender System What is demographic features?	Formal Lectures	Class Activity

			Demographic based filtering. Demographic RS applications.		
9			Hybrid Recommendation Approaches Hybridization designs. Monolithic hybridization design.	Formal Lectures	Class Activity and Quiz
10,11	=		Recommender Systems and Linked Open Data. Semantics-aware Recommendation. Linked Open Data for Recommender Systems. Feeding Recommender Systems with LOD. Exploiting Semantic Distance in Linked Open Data for Recommendation	Formal Lectures	Class Activity and Quiz
12	Mid2				
13,14	=		Context-Aware Recommender Systems. Introduction and Motivation. What Is Context? Modeling Contextual Information in RS: Traditional Approach. Paradigms for Incorporating Context in RS.	Formal Lectures	Class Activity
15	=		Recommender Systems Evaluation. Recommender system metrics evaluation. Recommender system decision support.	Formal Lectures	Class Activity

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1-Third Edition Springer 2022 Francesco Ricci • Lior Rokach • Bracha Shapir 2-Recommender Systems Algorithms and Applications Taylor & Francis Group,2021

	P. Pavan Kumar, S. Vairachilai, Sirisha Potluri,Sachi Nandan Mohanty 3-Recommender Systems An Introduction, Cambridge University Press,2011 DIETMARJANNACH,MARKUS ZANKER,ALEXANDER FELFERNIG GERHARDFRIEDRICH
Main references (sources)	Recommender Systems and Linked Open Data
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Scientific Research Methodology
2. Course Code:
3. Semester / Year:
Semester-2/ 2024
4. Description Preparation Date:
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total)
2 Hours / week
7. Course administrator's name (mention all, if more than one name)
Name: Khamael Al-Dulaimi Email: khamail.abbass@nahrainuniv.edu.iq

8. Course Objectives	
Course Objectives	• **The course aims to provide students with the basic concepts of scientific research methodology, how to write a thesis and research paper, and how to link them with a practical research project.** • **In this course, we will focus on writing the thesis and research paper, as we focus on the structure of the thesis and research paper, the method of collecting data, and writing the results.** • **Examples, exercises and presentation reports that enhance their ability to write in an academic manner** • **Use the English language in writing using academic words and correct grammar**

9. Teaching and Learning Strategies	
Strategy	**Lecture—Showing** **Worked Examples** **Socratic Questioning** **Discussion-Based Learning** **Project-Based Learning**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
W1	2		Introduction Structure of thesis Structure of manuscript	Lecture—Showing	
W2	2		How to write Introduction	Lecture—Showing	
W3	2		How to write Literature Review	Socratic Questioning And Discussion-Based Learning	Oral Questions
W4	2		Using terms in writing literature review	Worked Examples	Paper Quiz
W5	2		Poblem Identification & Formulation – Research Question – Investigation Question – Measurement Issues	Worked Examples	
W6	2		Research Design: Concept and Importance in Research – Features of a good research design –	Worked Examples	Online test
W7	2		Mid Exam		
W8	2		Collecting dataset Private dataset Public dataset	Socratic Questioning Discussion-Based Learning	Oral Questions
W9	2		Qualitative and Quantitative Research: Qualitative research – Quantitative research –	Worked Examples	Paper Quiz
W10	2		Data Analysis Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association	Worked Examples	Online test
W11	2		Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish .		
W12	2		? Ethical issues related to publishing, Plagiarism and Self-Plagiarism	Worked Examples	Oral Questions
W13	2		Assignment-1 writing-research	Worked Examples	Paper Quiz

			paper		
W14	2		Assignment-2 Writing Literature review	Project-Based Learning	assignment
W15	2		Academic Databases for Computer Science Discipline.		

11. Course Evaluation

First Mid-Term Exam 10%
Report 10%
Quizzes 5%
Assignments 5%
Total: 30%
Final Exam 70%

12. Learning and Teaching Resources

Required textbo (curricular books, if any)	
Main references (sources)	Bailey S. Academic writing: A practical guide for students. Psychology Press; 2003.
Recommended books and references (scientific journals, reports…)	All published papers from springer, IEEE, ELSEIVER are related to computer science discipline
Electronic References, Websites	1- Oshima, A. and Hogue, A., 2007. *Introduction to academic writing* (p. 3). Pearson/Longman. 2- Irvin LL. What is academic writing. Writing spaces: Readings on writing. 2 Jun 18;1:3-17.